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**Table 1. Selected fall chinook radio tagging recoveries compiled by the Snake River Laboratory of the Washington Department of Fish and Wildlife (Mendel et al. 1992) for the years 1991, 1992, and 1994. Days to pass each dam were calculated by subtracting the last detection from the first detection at each dam and adding 1 day. Days of migration were calculated by subtracting the first detection at the next upriver dam from the last detection at each dam and adding 1 day.**

chan/ code	LMN					LGS					LWG			
	First	Last	# Fish Pass	days to pass	days to migrate	First	Last	# Fish Pass	days to pass	days to migrate	First	Last	# Fish Pass	days to pass
1/34	09/28	10/01	1	4	9	10/09	10/27	1	19	2	10/28	10/28	1	1
1/44	10/30	11/05	1	7	2	11/06								
3/18	10/31	10/31	1	1	3	11/02	11/02	1	1	3	11/04	11/05	1	2
2/4	11/06	11/10	1	5	5	11/14								
1/36	11/11	11/12	1	2	2	11/13	11/14	1	2	6	11/19			
3/12	10/25	10/25 <sup>1</sup>			6	10/30								
1/26						10/02	10/04	1	3	2	10/05	10/06	1	2
2/43						10/05	10/05	1	1	2	10/06			
2/29						11/10	11/10	1	1	2	11/11			
1/28						09/15	09/15 <sup>a</sup>			3	09/17	09/19	1	3
3/17						09/17	09/17 <sup>a</sup>			2	09/18	09/19	1	2
2/48						09/21	09/21 <sup>a</sup>			2	09/22	09/28	1	7
3/14						09/24	09/24 <sup>a</sup>			2	09/25	09/28	1	4
3/20						09/25	09/25 <sup>a</sup>			3	09/27	09/29	1	3
1/49											10/22	10/23		2

<sup>1</sup> The fish was only detected at the top of the fish ladder.



**Table 2. List of available data. (Temperature and velocity data collected from transects of lower Snake River reservoirs; counts of adult salmon at lower Snake River Dams; hydroelectric turbine scroll case water temperatures; hydroelectric project water flows; tri-level thermographs; fish ladder water temperatures; summary fall chinook radio tagging.)**

<b>Type of Data</b>	<b>Location Collected</b>	<b>Source</b>	<b>Year</b>	<b>Duration</b>	<b>% Data Missing</b>
<b>Tri Level Thermograph at Transect 14</b>	IHR pool, SR Mile 15.5, 180 feet from the right bank at depths of 7, 37, and 75 feet	Data collected by University of Idaho. Statistics by CRITFC	1991	9/14-10/25	0.0
			1992	5/5-9/27	0.0
			1993	4/1-8/25	25.6
			1994	5/1-9/14	0.0
			1995	6/5-10/31	0.0
			1996	5/25-11/25	9.0
<b>Tri Level Thermograph at Transect 11</b>	LMN pool, SR Mile 44.0, 180 feet from the right bank at depths of 7, 43, and 85 feet.	Data collected by University of Idaho. Statistics by CRITFC	1991	9/13-10/31	0.0
			1992	5/5-8/20	0.0
			1993	4/1-8/25	0.0
			1994	5/1-10/30	20.0
			1995	6/5-10/31	13.2
			1996	5/25-12/14	0.0
<b>Tri Level Thermograph at Transect 8</b>	LGS Pool, SR Mile 80.5, 164 feet from the right bank at depths of 7, 40, and 80 feet.	Data collected by University of Idaho. Statistics by CRITFC	1991	9/13-10/31	2.0
			1992	5/5-9/28	0.0
			1993	4/1-8/25	0.0
			1994	5/1-10/31	8.5
			1995	6/16-12/7	12.9
			1996	5/26-12/24	0.0
<b>Tri-Level Thermograph at Transect 5</b>	LWG Pool SR Mile 110.5, 230 feet from right bank at depths of 7, 35, and 70 feet	Data collected by University of Idaho. Statistics by CRITFC	1991	8/28-10/31	0.0
			1992	5/5-9/28	11.3
			1993	4/1-9/9	0.0
			1994	4/28-10/31	0.0
			1995	8/28-10/31	0.0
			1996	5/26-10/31	0.0

Table 2

<b>Type of Data</b>	<b>Location Collected</b>	<b>Source</b>	<b>Year</b>	<b>Duration</b>	<b>% Data Missing</b>
<b>Transect temperatures and water velocities</b>	14 locations in the Snake, Clearwater and Columbia rivers (Table 3)	University of Idaho, Validated by CRITFC	1991	25 days over the period 7/23-10/15	29.8
<b>Transect temperatures and water velocities</b>	14 locations in the Snake, Clearwater and Columbia rivers (Table 3)	University of Idaho, Validated by CRITFC	1992	25 days over the period 7/5-10/13	24.8
<b>Fish Ladder Temperature</b>	IHR-Top of Ladder, Bottom of Ladder, Tailrace	University of Idaho, Validated by CRITFC	1991	5/11 - 10/31	35.2
			1992	5/19 - 10/31	4.8
		Validated by CRITFC	1993	5/26 - 9/2	0.0
			1994	7/26 - 10/31	0.0
		Unvalidated	1995		
		Unvalidated	1996		
	LMN-Top of Ladder, Bottom of Ladder, Tailrace	University of Idaho, Validated by CRITFC	1991	8/30 - 10/31	41.8
			1992	5/19 - 10/31	14.5
		Validated by CRITFC	1993	5/26 - 9/2	8.7
			1994	5/26 - 9/2	45.5
		Unvalidated	1995		
		Unvalidated	1996		
	LGS-Top of Ladder, Bottom of Ladder, Tailrace	University of Idaho, Validated by CRITFC	1991	8/30 - 10/31	2.1
			1992	6/9 - 10/31	0.0
		Validated by CRITFC	1993	5/27 - 9/3	0.0
			1994	7/25 - 10/31	0.3
		Unvalidated	1995		
		Unvalidated	1996		
	LWG-Top of Ladder, Bottom of Ladder, Tailrace	University of Idaho, Validated by CRITFC	1991	5/25 - 10/31	31.1
			1992	6/9 - 10/31	0.0
		Validated by CRITFC	1993	5/28 - 9/3	0.0
			1994	7/25 - 10/31	5.7

Table 2

Type of Data	Location Collected	Source	Year	Duration	% Data Missing
Fish Ladder Temperature	LWG-Top of Ladder, Bottom of Ladder, Tailrace	Unvalidated	1995		
		Unvalidated	1996		
Scroll case Temperature <sup>2</sup>	IHR <sup>3</sup>	USACE-Some data validated or corrected by CRITFC	1962-1996	4/1-10/31 annually	Negligible
	LMN <sup>4</sup>		1972-1996	4/1-10/31 annually	Negligible
	LGS <sup>5</sup>		1972-1996	4/1-10/31 annually	Negligible
	LWG <sup>6</sup>		1975-1996	4/1-10/31 annually	Negligible
	DWR <sup>7</sup>		1991-1996	4/1-10/31 annually	Negligible
Ladder Fish Counts	IHR	FISHCOUNT database-validated by this project	1962-1996	Generally 4/1-10/31 annually	Negligible

<sup>2</sup> Scrollcase temperatures are normally recorded throughout the year at all USACE projects. However, we only compiled data from April 1 through October 31 annually.

<sup>3</sup> Mercury thermometers are installed on two units; readings are taken from the operating unit (NMFS Memo).

<sup>4</sup> Mercury thermometers are installed on two units; readings are taken from the operating unit (NMFS Memo).

<sup>5</sup> Digital thermometer located in fishway sends readings to control room. Readings come from fishway as of 1996 season (NMFS memo).

<sup>6</sup> Digital thermometer located at charged cooling water strainer (takes water temperature reading from lower river depths) (NMFS memo). Prior to 1996, "scroll case" temperatures came from both fishways and scroll case for as long as five years (Tanovan Bolyvong personal communication).

<sup>7</sup> Since about 1995 DWR "scroll case" temperatures are the temperature originating from the TDG station at the hatchery. Prior to this, data came from the cooling water intakes located in the project tailrace on the turbine side of the river. (Tanovan Bolyvong, USACE personal communication)

Table 2

<b>Type of Data</b>	<b>Location Collected</b>	<b>Source</b>	<b>Year</b>	<b>Duration</b>	<b>% Data Missing</b>
<b>Ladder Fish Counts</b>	LMN	FISHCOUNT database-validated by this project		Generally 4/1-10/31 annually	Negligible
	LGS			Generally 4/1-10/31 annually	Negligible
	LWG			Generally 4/1-10/31 annually	Negligible
<b>Tributary Data</b>		Idaho Power			
<b>Gas Bubble Trauma Meters</b>	IHR- Forebay Station in center of river 15.0' below average forebay levels	Total dissolved gas monitoring program	1993-1996	4/1-9/30	8.2
	LMN-Forebay station located in center of river near the north end of spillway 15.0' below average forebay levels		1993-1996	4/1-9/30	6.1
	LGS-Forebay station located in center of river near the north end of spillway 15.0' below average forebay levels		1993-1996	4/1-9/30	15.8





Table 2

<b>Type of Data</b>	<b>Location Collected</b>	<b>Source</b>	<b>Year</b>	<b>Duration</b>	<b>% Data Missing</b>
<b>Gas Bubble Trauma Meters</b>	LWG-Station located in center of river just north of spillway 15.0' below average forebay levels	Total dissolved gas monitoring program	1993-1996	4/1-9/30	4.4

**Table 3. Transect designation, station description, and location (river mile) of temperature transect and tri-level thermograph stations in the Snake, Clearwater, and Columbia rivers.**

<b>Transect</b>	<b>Station Description</b>	<b>River Mile Location</b>
1A	North Fork Clearwater River	1.3
1B	Clearwater river above N. Fork	41.5
1C	Clearwater River below N. Fork	39.5
1	Snake River above Clearwater	140.5
2	Clearwater near mouth	0.8
3	Lower Granite Reservoir	129.5
4	Lower Granite Reservoir	119.5
5	Lower Granite Reservoir (transect and tri-level thermographs)	110.5
	Lower Granite Dam	107.6
6	Little Goose Reservoir	101.0
7	Little Goose Reservoir	91.5
8	Little Goose Reservoir (transect and tri-level thermographs)	80.5
	Little Goose Dam	70.0
9	Lower Monumental Reservoir	65.0
10	Lower Monumental Reservoir	57.5
11	Lower Monumental Reservoir (transect and tri-level thermographs)	44.0
	Lower Monumental Dam	41.7
12	Ice Harbor Reservoir	35.5
13	Ice Harbor Reservoir	25.0
14	Ice Harbor Reservoir (transect and tri-level thermographs)	15.5
	Ice Harbor Dam	9.6
15	Snake River Below Ice Harbor Dam	5.0
16	Columbia River below Snake R.	Columbia R.M. 323.5

**Table 4. Mean monthly temperatures of fish ladders at four Snake River dams from 1991 through 1994. Temperatures were recorded at the upper and lower ends of the fish ladders and at the tailrace of each dam (T. Bjornn, University of Idaho, personal communication).**

Project	Month	1991			1992			1993			1994		
		Tailrace	Lower	Upper	Tailrace	Lower	Upper	Tailrace	Lower	Upper	Tailrace	Lower	Upper
IHR	Aug	72.4	75.1		69.6	71.6	71.7	67.0	67.6	68.1	67.1	68.7	69.1
	Sep	68.6	72.1	68.2	67.4	69.7	67.7	66.3	67.7	67.7	68.0	68.7	68.4
	Oct	60.9	65.6	63.8	60.3	60.8	60.7				63.0	63.1	62.9
LMN	Aug	72.4		72.9	69.2	71.0	71.4	66.5	67.6	68.3	65.1	67.6	67.6
	Sep	69.5		69.1	70.2	67.0	67.6	67.0	67.4	68.0	68.2	68.9	69.0
	Oct	60.3		60.7		59.9	60.3					58.5	62.8
LGS	Aug		72.6	73.2	70.0	72.0	72.2	66.5	68.0	68.0	65.3	67.1	67.6
	Sep	66.8	68.1	68.4	66.0	66.5	66.3	68.1	69.0	68.9	69.0	69.5	69.8
	Oct	60.2	60.8	60.7	59.6	60.2	59.9				62.3	62.8	63.0
LWG	Aug	69.9	74.3	75.1	71.1	73.6	73.8	66.5	68.4	68.9	67.6	71.5	70.7
	Sep	66.0	66.6	67.3	62.7	65.9	65.5	66.2	69.0	69.8	68.4	69.4	68.2
	Oct	60.7	64.6	62.2	59.5	60.5	60.4				61.3	61.6	61.8

**Table 5. Mean daily scroll case temperatures recorded during the fall chinook immigration followed by the range of years and number of years (N) on which it is based for Bonneville Dam (BON), The Dalles Dam (TDA), John Day Dam (JDA), McNary Dam (MCN), Ice Harbor Dam (IHR), Lower Monumental Dam (LMN), Little Goose Dam (LGS), and Lower Granite Dam (LWG).**

Date	BON	TDA	JDA	MCN	IHR	LMN	LGS	LWG
1-Aug	70.2	68.8	67.8	68.2	70.1	69.2	70.7	70.3
2-Aug	70.2	69.5	68.1	68.4	70.3	69.3	70.4	70.4
3-Aug	70.2	69.3	68.0	68.5	70.3	69.3	70.6	70.6
4-Aug	70.3	69.6	68.6	68.6	70.6	69.3	70.6	70.2
5-Aug	70.3	69.5	68.6	68.6	70.6	69.6	70.7	70.8
6-Aug	70.7	70.2	68.6	68.7	70.6	69.7	70.8	70.7
7-Aug	70.7	70.1	68.4	68.9	70.6	69.8	70.7	70.9
8-Aug	70.9	69.8	68.5	68.8	70.8	70.0	70.7	71.2
9-Aug	70.6	69.9	68.5	69.0	70.9	70.2	71.4	71.3
10-Aug	70.6	70.2	69.0	69.2	71.0	70.2	71.3	71.2
11-Aug	70.8	70.0	69.0	69.3	71.0	70.5	71.4	71.4
12-Aug	70.7	70.1	69.0	69.3	71.1	70.6	71.5	71.1
13-Aug	70.9	70.3	68.8	69.3	71.3	70.6	71.3	71.8
14-Aug	71.0	70.6	68.9	69.5	71.1	71.0	71.4	71.5
15-Aug	71.0	70.4	68.9	69.3	71.2	70.7	71.4	71.1
16-Aug	70.9	70.6	69.2	69.3	71.3	70.7	71.4	71.4
17-Aug	70.9	70.5	68.4	69.2	71.4	70.8	71.4	71.5
18-Aug	70.9	70.6	69.1	69.1	71.3	70.8	71.4	71.6
19-Aug	70.9	70.3	68.6	69.2	71.3	70.7	71.4	71.3
20-Aug	70.8	70.2	68.9	69.2	71.1	70.7	71.4	71.5
21-Aug	70.7	70.5	69.1	69.2	71.1	70.7	71.6	71.5
22-Aug	70.6	70.3	69.1	69.3	71.1	70.7	71.5	71.4
23-Aug	70.7	70.3	69.1	69.1	71.1	70.8	71.3	70.9
24-Aug	70.4	70.0	68.5	69.2	71.1	70.7	71.1	70.9
25-Aug	70.1	70.2	68.9	69.1	71.0	70.8	71.1	70.7
26-Aug	70.2	70.0	68.4	69.1	70.9	70.8	71.0	70.3
27-Aug	70.3	69.9	68.6	69.0	70.9	70.8	71.0	70.5
28-Aug	70.7	70.0	68.4	68.9	70.8	70.7	70.9	69.9

29-Aug	70.2	69.8	68.4	69.1	70.7	70.8	70.9	69.7	
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Table 5 Date	BON	TDL	JDA	MCN	IHR	LMN	LGS	LWG
30-Aug	70.1	69.7	68.1	68.7	70.6	70.7	70.9	69.4
31-Aug	70.2	69.9	68.4	68.6	70.4	70.7	70.7	69.0
1-Sep	70.0	69.7	67.8	68.7	70.4	70.5	70.6	69.1
2-Sep	70.1	69.0	68.1	68.5	70.2	70.3	70.5	69.0
3-Sep	70.0	68.9	67.9	68.4	70.2	70.2	70.2	68.9
4-Sep	69.9	69.1	68.0	68.3	70.1	70.1	69.9	69.0
5-Sep	69.7	68.9	68.0	68.1	70.0	69.9	69.8	69.0
6-Sep	69.5	68.9	68.3	68.0	69.9	69.7	69.6	68.5
7-Sep	69.4	69.0	67.6	68.0	69.7	69.5	69.6	68.5
8-Sep	69.4	69.1	67.8	67.8	69.7	69.4	69.4	68.4
9-Sep	69.0	68.8	67.5	67.7	69.4	69.3	69.2	68.5
10-Sep	69.0	69.0	67.8	67.8	69.1	69.3	69.1	68.0
11-Sep	69.0	68.7	67.3	67.8	69.0	68.9	68.8	67.8
12-Sep	68.5	68.5	67.2	67.7	68.7	68.7	68.6	67.5
13-Sep	68.4	68.2	67.3	67.6	68.6	68.5	68.4	67.2
14-Sep	68.3	68.2	66.8	67.4	68.5	68.2	68.1	66.9
15-Sep	68.0	68.3	66.6	67.4	68.3	67.9	68.0	66.9
16-Sep	68.3	68.0	66.0	67.4	68.2	67.8	67.7	66.5
17-Sep	67.9	67.6	66.3	67.1	68.0	67.7	67.4	66.3
18-Sep	67.3	67.6	65.9	66.8	67.6	67.3	67.2	65.9
19-Sep	67.6	67.0	64.8	66.7	67.3	67.2	67.0	65.7
20-Sep	67.6	67.1	65.0	66.6	67.1	67.0	67.1	65.3
21-Sep	67.3	66.8	64.8	66.5	67.1	66.6	66.8	65.0
22-Sep	67.1	66.7	65.1	66.1	66.7	66.3	66.4	64.8
23-Sep	66.6	66.6	64.3	65.8	66.5	66.1	66.1	64.7
24-Sep	66.7	66.5	65.2	65.6	66.3	65.8	65.6	64.5
25-Sep	66.5	66.2	64.6	65.6	65.9	65.6	65.1	64.3
26-Sep	65.8	66.2	64.5	65.2	65.6	65.6	64.9	63.9
27-Sep	66.3	66.3	64.9	65.1	65.3	65.2	64.7	63.7
28-Sep	66.3	65.9	64.3	64.9	65.3	65.0	64.4	63.6
29-Sep	65.9	65.4	63.9	64.8	65.1	64.6	64.2	63.2
30-Sep	65.6	64.9	63.7	64.6	65.1	64.5	64.1	63.0
1-Oct	65.4	65.0	63.7	64.4	64.7	64.3	63.8	63.0

2-Oct	65.2	64.8	63.4	64.2	64.5	64.2	63.5	62.8	
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Table 5 Date	BON	TDL	JDA	MCN	IHR	LMN	LGS	LWG
3-Oct	65.0	64.2	63.3	63.9	64.3	63.9	63.0	62.4
4-Oct	64.6	64.4	62.6	63.8	64.0	63.7	63.0	62.4
5-Oct	64.2	63.9	62.8	63.4	63.9	63.3	62.9	61.8
6-Oct	64.1	63.8	62.2	63.2	63.7	63.0	62.7	61.5
7-Oct	63.7	63.6	62.4	63.0	63.4	62.9	62.6	61.2
8-Oct	63.5	63.4	61.8	62.8	63.2	62.5	62.4	61.1
9-Oct	63.4	63.2	61.6	62.6	63.0	62.2	62.2	60.8
10-Oct	63.1	62.7	61.6	62.5	62.7	62.0	61.7	60.5
11-Oct	62.8	62.6	61.1	62.2	62.4	61.7	61.7	60.3
12-Oct	62.5	62.2	60.2	61.9	62.1	61.4	61.4	60.2
13-Oct	62.6	62.1	60.8	61.6	61.9	61.2	61.1	60.0
14-Oct	62.0	61.6	61.0	61.3	61.4	60.9	60.9	60.0
15-Oct	61.8	61.4	60.2	60.9	61.3	60.6	60.5	59.8
16-Oct	61.5	61.4	60.2	60.6	60.9	60.5	60.3	59.8
17-Oct	61.2	61.0	60.4	60.4	60.6	60.1	59.9	59.2
18-Oct	61.2	60.7	59.6	60.3	60.3	59.8	59.8	59.0
19-Oct	60.5	60.3	59.3	60.1	59.9	59.5	59.5	58.5
20-Oct	60.4	60.5	59.0	59.6	59.4	59.3	59.2	58.3
21-Oct	60.3	60.2	58.7	59.3	59.2	58.9	58.9	58.1
22-Oct	60.1	59.9	58.2	59.1	58.9	58.8	58.5	57.5
23-Oct	59.9	59.1	58.1	58.8	58.6	58.5	58.3	57.3
24-Oct	59.5	59.1	57.6	58.6	58.4	58.2	58.1	57.1
25-Oct	59.5	58.9	57.5	58.2	58.2	58.0	57.8	56.8
26-Oct	59.1	58.5	58.2	58.1	57.8	57.8	57.5	56.5
27-Oct	58.7	58.4	57.1	57.9	57.6	57.5	57.2	56.0
28-Oct	58.6	58.2	57.0	57.4	57.3	57.2	57.3	55.8
29-Oct	58.4	57.6	56.8	57.2	56.9	56.8	57.0	55.6
30-Oct	57.6	57.3	56.9	57.0	56.8	56.5	56.4	55.4
31-Oct	57.4	57.1	56.0	56.8	56.5	56.3	56.2	55.1
<b>Range</b>	1981-19 95	1981-19 95	1981-19 95	1960-19 96	1963-19 96	1971-19 96	1970-19 96	1975-19 96
<b>N</b>	15	15	15	37	34	26	27	22

**Table 6. Daily mean temperatures from the total dissolved gas monitoring program in the Snake River. Gas bubble trauma monitoring stations are located above the dams (1993 \_ 1996).**

	<b>ICE HARBOR</b>				<b>LOWER MONUMENTAL</b>				<b>LITTLE GOOSE</b>				<b>LOWER GRANITE</b>			
<b>DATE</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>
1-Aug	66.5	71.9	72.4	71.1	67.3	69.0	72.6	70.5	66.4	67.6		71.4	67.3	69.0	72.6	70.5
2-Aug	67.6	73.0	72.1	70.9	69.4	69.5	72.8	70.3	69.7	66.5		70.4	69.4	69.5	72.8	70.3
3-Aug	67.9	72.8	72.5	70.8	69.7	68.4	72.4	70.2	72.1	65.8		70.4	69.7	68.4	72.4	70.2
4-Aug	68.3	73.0	72.5	70.3	68.0	68.2	71.5	69.8	69.3	65.6		70.3	68.0	68.2	71.5	69.8
5-Aug	68.6	72.2	72.4	69.7	69.1	66.4	71.4	69.2	68.6	62.9		69.8	69.1	66.4	71.4	69.2
6-Aug	69.4	70.6	72.7	69.3	69.3	66.9	71.9	68.9	69.6	63.4		69.3	69.3	66.9	71.9	68.9
7-Aug	68.9	72.5	72.6		68.8	69.8	71.2	69.6	68.6	65.9		69.8	68.8	69.8	71.2	69.6
8-Aug	68.8	70.0	72.0		68.7	67.6	71.1	70.4	69.3	64.8	69.8	71.5	68.7	67.6	71.1	70.4
9-Aug	69.0	70.8	71.3		69.0	67.7	71.0	71.0	69.3	65.7	71.5	72.1	69.0	67.7	71.0	71.0
10-Aug	69.0	71.8	71.3		69.0	69.0	71.4	71.7	69.3	66.7	70.8	73.2	69.0	69.0	71.4	71.7
11-Aug	69.1	72.5	71.2		68.9	69.4	70.6	70.5	67.8	67.7	69.1	71.0	68.9	69.4	70.6	70.5
12-Aug	69.7	73.4	71.1		69.7	69.4	70.6	71.1	68.7	68.0	68.9	70.2	69.7	69.4	70.6	71.1
13-Aug	69.3	74.3	70.8	71.8	70.0	69.9	72.0	71.5	68.2	68.2	70.1	72.0	70.0	69.9	72.0	71.5
14-Aug	69.4	74.0	70.6	72.4	70.7	70.1	72.5	70.9	67.9	68.0	70.1	71.8	70.7	70.1	72.5	70.9
15-Aug	69.6	71.8	70.3	70.6	70.7	68.1	72.5	70.1	68.3	66.1	69.1	68.3	70.7	68.1	72.5	70.1
16-Aug	69.6	73.6	70.6	67.7	70.3	68.3	75.1	70.7	68.7	67.1	69.0	68.4	70.3	68.3	75.1	70.7
17-Aug	69.3	74.0	70.1	68.0	69.7	68.9	75.2	70.6	68.0	67.9	68.6	68.1	69.7	68.9	75.2	70.6
18-Aug	69.4	73.3	69.9	67.2	70.7	70.5	73.4	70.0	69.6	69.5	68.4	67.9	70.7	70.5	73.4	70.0

Table 6																
	<b>ICE HARBOR</b>				<b>LOWER MONUMENTAL</b>				<b>LITTLE GOOSE</b>				<b>LOWER GRANITE</b>			
<b>DATE</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>
19-Aug	69.3	72.3	69.6	67.0	71.2	69.6	72.1	69.9	70.2	70.4	68.8	67.5	71.2	69.6	72.1	69.9
20-Aug	69.1	71.9	69.5	66.8	69.1	68.7	72.7	69.5	68.8	69.5	68.4	67.2	69.1	68.7	72.7	69.5
21-Aug	69.4	71.6	70.1	66.7	68.9	68.9	73.5	69.7	68.4	69.7	68.1	67.9	68.9	68.9	73.5	69.7
22-Aug	69.6	73.3	70.2	66.9	70.5	68.9	70.9	70.5	69.3	69.2	68.7	68.4	70.5	68.9	70.9	70.5
23-Aug	69.3	73.8	69.9	66.6	70.4	69.4	69.8	70.7	69.9	69.9	68.4	68.4	70.4	69.4	69.8	70.7
24-Aug	69.0	73.0	70.1	66.6	69.8	70.0	69.0	71.0	69.5	70.4	66.9	68.3	69.8	70.0	69.0	71.0
25-Aug	68.8	72.5	69.9	66.8	68.4	69.8	69.3	70.9	69.4	71.1	68.4	70.1	68.4	69.8	69.3	70.9
26-Aug	68.6	73.3	69.7	66.9	65.6	69.8	68.8	70.7	69.4	71.6	67.3	70.7	65.6	69.8	68.8	70.7
27-Aug	68.5	72.2	69.7	66.8	66.1	71.0	69.5	68.9	69.6	72.3	68.3	69.0	66.1	71.0	69.5	68.9
28-Aug	68.6	74.5	69.4	66.5	68.6	71.0	69.5	68.8	69.1	72.9	67.7	68.0	68.6	71.0	69.5	68.8
29-Aug	68.6	73.7	68.8	66.6	69.0	70.3	69.3	69.8	70.1	71.3	66.6	68.7	69.0	70.3	69.3	69.8
30-Aug	68.9	72.4	68.6	66.1	69.6	70.8	70.0	68.4	70.9	71.8	67.6	67.1	69.6	70.8	70.0	68.4
31-Aug	69.0	73.8	69.1	65.3	68.8	71.9	71.1	67.4	70.5	72.4	68.6	63.8	68.8	71.9	71.1	67.4
1-Sep	69.2	75.5	69.6	65.1	68.4	72.1	71.2	66.7	70.6	72.8	69.1	63.8	68.4	72.1	71.2	66.7
2-Sep	69.0	75.1	68.5	65.5	68.8	70.7	71.3	66.3	70.1	72.1	70.1	64.3	68.8	70.7	71.3	66.3
3-Sep	70.5	74.3	69.1	64.5	70.2	70.3	72.3	65.8	71.5	71.5	72.1	63.7	70.2	70.3	72.3	65.8
4-Sep	69.4	73.9	68.4	63.4	69.4	69.9	69.6	65.3	71.1	71.3	69.3	61.9	69.4	69.9	69.6	65.3
5-Sep	71.0	72.9	69.0	62.8	70.4	71.0	69.1	65.0	71.4	71.8	67.2	61.0	70.4	71.0	69.1	65.0

Table 6	ICE HARBOR				LOWER MONUMENTAL				LITTLE GOOSE				LOWER GRANITE			
DATE	1993	1994	1995	1996	1993	1994	1995	1996	1993	1994	1995	1996	1993	1994	1995	1996
6-Sep	70.5	72.6	69.3	62.8	71.9	71.1	69.5	65.1	72.1	72.0	68.4	61.3	71.9	71.1	69.5	65.1
7-Sep	71.0	73.9	69.1		71.3	71.1	68.1	65.2	71.8	71.6	68.1	62.0	71.3	71.1	68.1	65.2
8-Sep	71.0	73.0	69.4		70.2	70.8	67.4	65.0	71.5		68.9	61.8	70.2	70.8	67.4	65.0
9-Sep	71.1	74.7	69.9	63.2	70.7	70.3	67.9	64.9	71.4		69.6	61.9	70.7	70.3	67.9	64.9
10-Sep	70.8	72.3	69.0	63.7	70.9	70.1	68.7	65.6	71.9		69.1	62.5	70.9	70.1	68.7	65.6
11-Sep	70.2	74.5	69.0	63.3	69.7	70.4	68.7	66.5	69.3		69.3	62.9	69.7	70.4	68.7	66.5
12-Sep	70.1	72.4	70.2	62.9	69.3	70.3	70.1	65.3	69.0		69.9	63.2	69.3	70.3	70.1	65.3
13-Sep	70.5	71.4	71.0	61.8	69.3	70.5	71.6	64.2	69.5		70.3	62.1	69.3	70.5	71.6	64.2
14-Sep	69.8	74.7	71.1	61.8	68.8	70.1	71.8	64.4	69.2		71.1	62.2	68.8	70.1	71.8	64.4
15-Sep	69.6	73.5	70.7	61.7	68.6	70.0	71.9	64.3			71.7	62.3	68.6	70.0	71.9	64.3
16-Sep	69.5	74.0	69.8	61.4	68.6	70.3	71.8	64.2	68.8		70.8	61.9	68.6	70.3	71.8	64.2
17-Sep	69.4	72.8	69.3	61.4	68.3	71.0	71.5	64.3			70.3		68.3	71.0	71.5	64.3
18-Sep	68.8	71.3	69.4	61.1	67.7	70.9	71.7	64.3	68.5		69.3		67.7	70.9	71.7	64.3
19-Sep	68.2	72.6	69.4	60.7	67.1	71.1	72.7	64.0			69.7		67.1	71.1	72.7	64.0
20-Sep	67.8	73.1	69.9	60.3	66.7	70.7	71.6	63.5			69.9		66.7	70.7	71.6	63.5
21-Sep	67.6	72.7	69.8		67.0	71.4	69.9	63.1			69.5		67.0	71.4	69.9	63.1
22-Sep	67.4	74.1	68.9	59.3	66.7	71.2	68.7	63.0	66.9		69.0		66.7	71.2	68.7	63.0
23-Sep	67.3	75.2	68.4	59.2	66.2	70.9	70.0	62.7	66.9		68.9		66.2	70.9	70.0	62.7
24-Sep	66.8	74.4	68.2		65.9	70.8	70.0	62.4	66.7		68.8		65.9	70.8	70.0	62.4
25-Sep	66.9	75.3	67.8		66.0	70.5	70.0	62.7	66.5		67.9		66.0	70.5	70.0	62.7

Table 6																
	<b>ICE HARBOR</b>				<b>LOWER MONUMENTAL</b>				<b>LITTLE GOOSE</b>				<b>LOWER GRANITE</b>			
<b>DATE</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>
26-Sep	66.2	73.7	67.6		65.9	70.4	70.3	62.5			67.4		65.9	70.4	70.3	62.5
27-Sep	66.4	71.1			66.3	70.4		62.3	66.3				66.3	70.4		62.3
28-Sep	66.0				65.9	70.6		62.3	66.1				65.9	70.6		62.3
29-Sep								62.4								62.4
30-Sep								62.9								62.9

**Table 7. Hydroelectric dams of the Columbia/Snake rivers with miles from the mouth of the river, year placed in operation, and length of reservoir in miles (Mundy et al. 1994).**

**Reservoir**

<u>Columbia River</u>	<u>Location</u>	<u>Year</u>	<u>Length</u>
Bonneville	145.5	1938	46
The Dalles	191.5	1957	24
John Day	215.6	1968	76
McNary	292.0	1953	61
Priest Rapids	397.1	1959	18
Wanapum	415.8	1963	38
Rock Island	453.4	1933	21
Rocky Reach	473.7	1961	42
Wells	515.1	1967	29
Chief Joseph	545.1	1955	52
Grand Coulee	596.6	1941	151

**Snake River**

Ice Harbor	9.7	1961	32
Lower Monumental	41.7	1969	29
Little Goose	70.0	1970	37
Lower Granite	107.6	1975	39
Hells Canyon	247.0	1967	22
Oxbow	273.0	1961	12
Brownlee	285.0	1958	57

**Table 8. Correlation coefficients between temperature measurements from tri-level thermograph (TLT 8 bottom, middle, and surface), fish ladder (top, bottom, and tailrace), and total dissolved gas (TDG) monitoring locations at Little Goose Dam (LGS), on 77 dates, August 16 – October 31, 1993 - 1996.**

<u>1993</u>	<u>Tri-Level Thermograph Station 8</u>				<u>Fish</u>	<u>Ladder</u>	<u>Gas Monitoring Stations</u>		
	<u>Scroll case</u>	<u>Bottom</u>	<u>Middle</u>	<u>Surface</u>	<u>Tail race</u>	<u>Bottom</u>	<u>Top</u>	<u>TDG1</u>	<u>TDG2</u>
<u>Scroll case</u>	<u>1.000</u>								
<u>TLT 8B</u>	<u>0.699</u>	<u>1.000</u>							
<u>TLT 8M</u>	<u>0.507</u>	<u>0.933</u>	<u>1.000</u>						
<u>TLT 8S</u>	<u>0.637</u>	<u>0.785</u>	<u>0.777</u>	<u>1.000</u>					
<u>LGS TR</u>	<u>0.660</u>	<u>0.657</u>	<u>0.551</u>	<u>0.309</u>	<u>1.000</u>				
<u>LGS Bot</u>	<u>0.175</u>	<u>-0.191</u>	<u>-0.221</u>	<u>-0.367</u>	<u>0.516</u>	<u>1.000</u>			
<u>LGS Top</u>	<u>0.014</u>	<u>-0.348</u>	<u>-0.417</u>	<u>-0.532</u>	<u>0.308</u>	<u>0.914</u>	<u>1.000</u>		
<u>TDG</u>	<u>0.339</u>	<u>0.187</u>	<u>0.042</u>	<u>-0.158</u>	<u>0.734</u>	<u>0.839</u>	<u>0.727</u>	<u>1.000</u>	
<u>Mean</u>	<u>66.94</u>	<u>67.68</u>	<u>68.32</u>	<u>66.77</u>	<u>67.31</u>	<u>68.37</u>	<u>68.23</u>	<u>69.42</u>	
<u>St.dev.</u>	<u>3.16</u>	<u>0.94</u>	<u>0.69</u>	<u>0.68</u>	<u>0.86</u>	<u>0.80</u>	<u>1.11</u>	<u>1.64</u>	
<u>N</u>	<u>77</u>	<u>10</u>	<u>10</u>	<u>10</u>	<u>19</u>	<u>19</u>	<u>19</u>	<u>38</u>	

<u>1994</u>	<u>Tri-Level Thermograph Station 8</u>				<u>Fish</u>	<u>Ladder</u>	<u>Gas Monitoring Stations</u>		
	<u>Scroll case</u>	<u>Bottom</u>	<u>Middle</u>	<u>Surface</u>	<u>Tail race</u>	<u>Bottom</u>	<u>Top</u>	<u>TDG1</u>	<u>TDG2</u>
<u>Scroll case</u>	<u>1.000</u>								
<u>TLT 8B</u>	<u>0.959</u>	<u>1.000</u>							

<u>TLT 8M</u>	<u>0.948</u>	<u>0.992</u>	<u>1.000</u>					
<u>TLT 8S</u>	<u>0.518</u>	<u>0.535</u>	<u>0.937</u>	<u>1.000</u>				
<u>LGS TR</u>	<u>0.989</u>	<u>0.976</u>	<u>0.964</u>	<u>0.501</u>	<u>1.000</u>			
<u>LGS Bot</u>	<u>0.986</u>	<u>0.975</u>	<u>0.971</u>	<u>0.684</u>	<u>0.995</u>	<u>1.000</u>		
<u>LGS Top</u>	<u>0.987</u>	<u>0.974</u>	<u>0.969</u>	<u>0.673</u>	<u>0.996</u>	<u>1.000</u>	<u>1.000</u>	
<u>TDG</u>	<u>0.929</u>	<u>0.561</u>	<u>0.778</u>	<u>0.838</u>	<u>0.912</u>	<u>0.930</u>	<u>0.943</u>	<u>1.000</u>
 <u>Mean</u>	 <u>67.51</u>	 <u>66.21</u>	 <u>66.62</u>	 <u>70.12</u>	 <u>66.01</u>	 <u>66.62</u>	 <u>66.89</u>	 <u>71.01</u>
<u>St.dev.</u>	<u>3.834</u>	<u>4.39</u>	<u>4.59</u>	<u>0.73</u>	<u>3.84</u>	<u>3.89</u>	<u>3.93</u>	<u>1.50</u>
<u>N</u>	<u>73</u>	<u>77</u>	<u>77</u>	<u>30</u>	<u>77</u>	<u>77</u>	<u>77</u>	<u>22</u>



Table 8. Continued.

<b><u>1995</u></b>	<u>Tri-Level Thermograph</u> <u>Station 8</u>				<u>Fish</u>	<u>Ladder</u>		<u>Gas Monitoring</u> <u>Stations</u>	
	<u>Scroll</u> <u>case</u>	<u>Bottom</u>	<u>Middle</u>	<u>Surface</u>	<u>Tail race</u>	<u>Bottom</u>	<u>Top</u>	<u>TDG1</u>	<u>TDG2</u>
<u>Scroll</u> <u>case</u>	<u>1.000</u>								
<u>TLT 8B</u>	<u>0.273</u>	<u>1.000</u>							
<u>TLT 8M</u>	<u>0.971</u>	<u>0.940</u>	<u>1.000</u>						
<u>TLT 8S</u>	<u>0.975</u>	<u>0.750</u>	<u>0.995</u>	<u>1.000</u>					
<u>LGS TR</u>									
<u>LGS Bot</u>									
<u>LGS Top</u>									
<u>TDG</u>	<u>0.404</u>	<u>0.841</u>	<u>0.872</u>	<u>0.762</u>				<u>1.000</u>	
<u>Mean</u>	<u>63.32</u>	<u>65.45</u>	<u>62.68</u>	<u>63.13</u>				<u>67.09</u>	
<u>St.dev.</u>	<u>4.15</u>	<u>0.99</u>	<u>4.13</u>	<u>4.39</u>				<u>0.93</u>	
<u>N</u>	<u>77</u>	<u>46</u>	<u>77</u>	<u>77</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>41</u>	

<b><u>1996</u></b>	<u>Tri-Level Thermograph</u> <u>Station 8</u>				<u>Fish</u>	<u>Ladder</u>		<u>Gas Monitoring</u> <u>Stations</u>	
	<u>Scroll</u> <u>case</u>	<u>Bottom</u>	<u>Middle</u>	<u>Surface</u>	<u>Tail race</u>	<u>Bottom</u>	<u>Top</u>	<u>TDG1</u>	<u>TDG2</u>
<u>Scroll</u> <u>case</u>	<u>1.000</u>								
<u>TLT 8B</u>	<u>0.838</u>	<u>1.000</u>							
<u>TLT 8M</u>	<u>0.853</u>	<u>0.997</u>	<u>1.000</u>						
<u>TLT 8S</u>	<u>0.960</u>	<u>0.902</u>	<u>0.919</u>	<u>1.000</u>					

<u>LGS TR</u>									
<u>LGS Bot</u>									
<u>LGS Top</u>									
<u>TDG 1</u>	<u>-0.235</u>	<u>-0.822</u>	<u>-0.819</u>	<u>-0.572</u>			<u>1.000</u>		
<u>TDG 2</u>	<u>0.214</u>	<u>0.635</u>	<u>0.578</u>	<u>0.239</u>			<u>-0.798</u>	<u>1.000</u>	
 <u>Mean</u>	 <u>62.77</u>	 <u>61.64</u>	 <u>62.11</u>	 <u>63.17</u>			 <u>71.01</u>	 <u>64.95</u>	
<u>St. dev.</u>	<u>4.13</u>	<u>3.22</u>	<u>3.31</u>	<u>4.16</u>			<u>1.50</u>	<u>2.83</u>	
<u>N</u>	<u>77</u>	<u>77</u>	<u>77</u>	<u>77</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>22</u>	<u>31</u>

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**Table 9. Correlation coefficients between temperature measurements from tri-level thermograph (TLT 8 bottom, middle, and surface), fish ladder (top, bottom, and tailrace), and temperature transects at monitoring locations at Little Goose Dam (LGS) from August 16 – October 31, 1991 – 1992.**

1991	Scroll Case	Tri-level Thermograph			Fish Ladder			Transect 5			Transect 6			Transect 7			Transect 8			Transect 9		
		Station 8			Tail race	Bot-tom	Top	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
		Bot-tom	Mid-dle	Sur-face																		
TLT 8B	0.965	1.000																				
TLT 8M	0.965	0.999	1.000																			
TLT 8S	0.978	0.992	0.994	1.000																		
LGS TR	0.984	0.976	0.977	0.990	1.000																	
LGS Bot																						
LGS Top	0.978	0.973	0.974	0.984	0.996		1.000															
Tr5 Mean	0.922	0.926	0.933	0.958	0.914		0.919	1.000														
Tr5 Min	0.557	0.803	0.807	0.793	0.593		0.619	0.742	1.000													
Tr5 Max	0.975	0.939	0.944	0.957	0.987		0.964	0.952	0.572	1.000												
Tr6 Mean	0.855	0.850	0.862	0.925	0.861		0.889	0.961	0.807	0.892	1.000											
Tr6 Min	0.829	0.688	0.708	0.799	0.841		0.863	0.945	0.805	0.879	0.992	1.000										
Tr6 Max	0.877	0.884	0.888	0.932	0.860		0.898	0.974	0.804	0.901	0.990	0.971	1.000									
Tr7 Mean	0.912	0.895	0.906	0.944	0.898		0.917	0.955	0.659	0.961	0.931	0.924	0.936	1.000								
Tr7 Min	0.872	0.865	0.875	0.862	0.878		0.859	0.925	0.707	0.918	0.942	0.938	0.930	0.978	1.000							
Tr7 Max	0.925	0.772	0.785	0.849	0.917		0.938	0.956	0.677	0.954	0.933	0.920	0.947	0.986	0.955	1.000						
Tr8 Mean	0.965	0.952	0.960	0.985	0.973		0.965	0.938	0.550	0.986	0.894	0.880	0.906	0.966	0.922	0.963	1.000					
Tr8 Min	0.937	0.891	0.898	0.935	0.943		0.964	0.890	0.536	0.954	0.873	0.862	0.880	0.957	0.928	0.955	0.974	1.000				
Tr8 Max	0.935	0.769	0.789	0.854	0.970		0.917	0.903	0.576	0.943	0.881	0.871	0.893	0.926	0.879	0.948	0.969	0.939	1.000			
Tr9 Mean	0.973	0.928	0.928	0.901	0.975		0.951	0.912	0.557	0.954	0.846	0.820	0.883	0.919	0.865	0.931	0.966	0.941	0.940	1.000		
Tr9 Min	0.914	0.605	0.608	0.606	0.894		0.886	0.880	0.546	0.908	0.828	0.815	0.864	0.908	0.850	0.921	0.938	0.931	0.914	0.975	1.000	
Tr9 Max	0.990	0.979	0.982	0.968	0.974		0.961	0.911	0.544	0.963	0.847	0.820	0.876	0.903	0.857	0.928	0.965	0.937	0.946	0.982	0.938	1.000
Mean	66.3	61.3	61.4	61.7	63.9		65.0	64.6	62.0	66.7	64.3	63.8	64.8	65.3	64.0	66.7	66.0	64.6	68.1	66.3	65.6	67.0
Stdev	5.886	3.023	3.136	3.544	5.276		5.105	3.484	2.202	4.881	3.064	2.938	3.283	4.073	3.290	4.517	3.782	3.087	4.347	3.605	3.641	3.833
N	77	48	48	48	47		63	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20

**Table 9. Continued.**

<u>1992</u>	<u>Scroll</u> <u>Case</u>	<u>Tri-level</u> <u>Thermograph</u> <u>Station 8</u>			<u>Fish Ladder</u>			<u>Transect 5</u>			<u>Transect 6</u>			<u>Transect 7</u>			<u>Transect 8</u>			<u>Transect 9</u>		
		<u>Bot-</u> <u>tom</u>	<u>Mid-</u> <u>dle</u>	<u>Sur-</u> <u>face</u>	<u>Tail</u> <u>race</u>	<u>Bot-</u> <u>tom</u>	<u>Top</u>	<u>Mean</u>	<u>Min</u>	<u>Max</u>	<u>Mean</u>	<u>Min</u>	<u>Max</u>	<u>Mean</u>	<u>Min</u>	<u>Max</u>	<u>Mean</u>	<u>Min</u>	<u>Max</u>	<u>Mean</u>	<u>Min</u>	<u>Max</u>
<u>TLT 8B</u>	<u>0.962</u>	<u>1.000</u>																				
<u>TLT 8M</u>	<u>0.958</u>	<u>0.989</u>	<u>1.000</u>																			
<u>TLT 8S</u>	<u>0.937</u>	<u>0.959</u>	<u>0.985</u>	<u>1.000</u>																		
<u>LGS TR</u>	<u>0.992</u>	<u>0.973</u>	<u>0.958</u>	<u>0.932</u>	<u>1.000</u>																	
<u>LGS Bot</u>	<u>0.984</u>	<u>0.955</u>	<u>0.959</u>	<u>0.969</u>	<u>0.988</u>	<u>1.000</u>																
<u>LGS Top</u>	<u>0.982</u>	<u>0.953</u>	<u>0.958</u>	<u>0.967</u>	<u>0.986</u>	<u>0.999</u>	<u>1.000</u>															
<u>Tr5 Mean</u>	<u>0.902</u>	<u>0.965</u>	<u>0.958</u>	<u>0.938</u>	<u>0.911</u>	<u>0.924</u>	<u>0.922</u>	<u>1.000</u>														
<u>Tr5 Min</u>	<u>0.704</u>	<u>0.754</u>	<u>0.688</u>	<u>0.578</u>	<u>0.725</u>	<u>0.643</u>	<u>0.639</u>	<u>0.822</u>	<u>1.000</u>													
<u>Tr5 Max</u>	<u>0.961</u>	<u>0.966</u>	<u>0.988</u>	<u>0.996</u>	<u>0.963</u>	<u>0.982</u>	<u>0.982</u>	<u>0.953</u>	<u>0.670</u>	<u>1.000</u>												
<u>Tr6 Mean</u>	<u>0.899</u>	<u>0.951</u>	<u>0.941</u>	<u>0.925</u>	<u>0.910</u>	<u>0.928</u>	<u>0.924</u>	<u>0.994</u>	<u>0.806</u>	<u>0.947</u>	<u>1.000</u>											
<u>Tr6 Min</u>	<u>0.903</u>	<u>0.958</u>	<u>0.948</u>	<u>0.929</u>	<u>0.914</u>	<u>0.927</u>	<u>0.924</u>	<u>0.990</u>	<u>0.800</u>	<u>0.953</u>	<u>0.997</u>	<u>1.000</u>										
<u>Tr6 Max</u>	<u>0.896</u>	<u>0.955</u>	<u>0.944</u>	<u>0.928</u>	<u>0.907</u>	<u>0.926</u>	<u>0.923</u>	<u>0.991</u>	<u>0.804</u>	<u>0.941</u>	<u>0.998</u>	<u>0.990</u>	<u>1.000</u>									
<u>Tr7 Mean</u>	<u>0.936</u>	<u>0.974</u>	<u>0.983</u>	<u>0.980</u>	<u>0.939</u>	<u>0.960</u>	<u>0.959</u>	<u>0.977</u>	<u>0.719</u>	<u>0.983</u>	<u>0.975</u>	<u>0.975</u>	<u>0.976</u>	<u>1.000</u>								
<u>Tr7 Min</u>	<u>0.938</u>	<u>0.979</u>	<u>0.975</u>	<u>0.957</u>	<u>0.940</u>	<u>0.952</u>	<u>0.951</u>	<u>0.978</u>	<u>0.743</u>	<u>0.975</u>	<u>0.979</u>	<u>0.979</u>	<u>0.980</u>	<u>0.996</u>	<u>1.000</u>							
<u>Tr7 Max</u>	<u>0.924</u>	<u>0.940</u>	<u>0.965</u>	<u>0.990</u>	<u>0.927</u>	<u>0.969</u>	<u>0.968</u>	<u>0.955</u>	<u>0.641</u>	<u>0.985</u>	<u>0.953</u>	<u>0.952</u>	<u>0.955</u>	<u>0.992</u>	<u>0.981</u>	<u>1.000</u>						
<u>Tr8 Mean</u>	<u>0.975</u>	<u>0.985</u>	<u>0.996</u>	<u>0.987</u>	<u>0.980</u>	<u>0.986</u>	<u>0.985</u>	<u>0.946</u>	<u>0.697</u>	<u>0.990</u>	<u>0.944</u>	<u>0.946</u>	<u>0.943</u>	<u>0.981</u>	<u>0.975</u>	<u>0.977</u>	<u>1.000</u>					
<u>Tr8 Min</u>	<u>0.976</u>	<u>0.991</u>	<u>0.972</u>	<u>0.921</u>	<u>0.981</u>	<u>0.961</u>	<u>0.960</u>	<u>0.952</u>	<u>0.774</u>	<u>0.969</u>	<u>0.951</u>	<u>0.955</u>	<u>0.949</u>	<u>0.968</u>	<u>0.975</u>	<u>0.945</u>	<u>0.984</u>	<u>1.000</u>				
<u>Tr8 Max</u>	<u>0.942</u>	<u>0.923</u>	<u>0.954</u>	<u>0.987</u>	<u>0.947</u>	<u>0.985</u>	<u>0.985</u>	<u>0.917</u>	<u>0.601</u>	<u>0.979</u>	<u>0.920</u>	<u>0.919</u>	<u>0.923</u>	<u>0.969</u>	<u>0.955</u>	<u>0.985</u>	<u>0.985</u>	<u>0.944</u>	<u>1.000</u>			
<u>Tr9 Mean</u>	<u>0.978</u>	<u>0.967</u>	<u>0.965</u>	<u>0.947</u>	<u>0.977</u>	<u>0.983</u>	<u>0.980</u>	<u>0.891</u>	<u>0.676</u>	<u>0.962</u>	<u>0.895</u>	<u>0.897</u>	<u>0.898</u>	<u>0.934</u>	<u>0.931</u>	<u>0.932</u>	<u>0.985</u>	<u>0.971</u>	<u>0.967</u>	<u>1.000</u>		
<u>Tr9 Min</u>	<u>0.986</u>	<u>0.978</u>	<u>0.972</u>	<u>0.942</u>	<u>0.987</u>	<u>0.978</u>	<u>0.973</u>	<u>0.903</u>	<u>0.710</u>	<u>0.962</u>	<u>0.905</u>	<u>0.908</u>	<u>0.907</u>	<u>0.937</u>	<u>0.935</u>	<u>0.929</u>	<u>0.986</u>	<u>0.978</u>	<u>0.960</u>	<u>0.997</u>	<u>1.000</u>	
<u>Tr9 Max</u>	<u>0.941</u>	<u>0.909</u>	<u>0.919</u>	<u>0.935</u>	<u>0.937</u>	<u>0.982</u>	<u>0.985</u>	<u>0.874</u>	<u>0.601</u>	<u>0.956</u>	<u>0.885</u>	<u>0.885</u>	<u>0.891</u>	<u>0.929</u>	<u>0.925</u>	<u>0.941</u>	<u>0.973</u>	<u>0.943</u>	<u>0.980</u>	<u>0.984</u>	<u>0.972</u>	<u>1.000</u>
<u>Mean</u>	<u>65.2</u>	<u>67.7</u>	<u>68.4</u>	<u>68.7</u>	<u>64.5</u>	<u>65.2</u>	<u>65.0</u>	<u>66.0</u>	<u>62.9</u>	<u>67.8</u>	<u>65.6</u>	<u>65.2</u>	<u>65.9</u>	<u>66.6</u>	<u>65.8</u>	<u>67.3</u>	<u>67.1</u>	<u>66.1</u>	<u>68.3</u>	<u>67.2</u>	<u>66.8</u>	<u>67.9</u>
<u>Stdev</u>	<u>5.230</u>	<u>4.059</u>	<u>3.899</u>	<u>4.235</u>	<u>4.966</u>	<u>5.154</u>	<u>5.208</u>	<u>5.273</u>	<u>4.621</u>	<u>5.399</u>	<u>5.127</u>	<u>5.156</u>	<u>5.250</u>	<u>5.335</u>	<u>4.874</u>	<u>5.662</u>	<u>4.694</u>	<u>4.232</u>	<u>5.340</u>	<u>4.303</u>	<u>4.242</u>	<u>4.703</u>
<u>N</u>	<u>76</u>	<u>44</u>	<u>44</u>	<u>44</u>	<u>77</u>	<u>77</u>	<u>77</u>	<u>13</u>	<u>13</u>	<u>13</u>	<u>13</u>	<u>13</u>	<u>13</u>	<u>13</u>	<u>13</u>	<u>13</u>	<u>13</u>	<u>13</u>	<u>13</u>	<u>13</u>	<u>13</u>	<u>13</u>

**End Table 11.**



**Table 10. Differences (degrees F) between temperatures recorded at the Lower Granite Dam scroll case and the daily mean, minimum, and maximum transect temperatures recorded immediately upstream (#14) and downstream (#15) of LWG. Differences are expressed as scroll case temperatures minus transect temperatures, therefore a positive number means the scroll case temperature is greater than that at the transects. Also noted are the t-statistics and p-values for a paired-t test between temperatures recorded at the scroll case and mean, minimum, and maximum transect temperatures. Data presented is for the time period from start of data collection (July 23 in 1991 and July 1 in 1992) through September 30.**

1991

<u>Difference</u>	<u>Transect 5 (n=19)</u>			<u>Transect 6 (n=19)</u>		
	<u>Mean</u>	<u>Minimum</u>	<u>Maximum</u>	<u>Mean</u>	<u>Minimum</u>	<u>Maximum</u>
<u>e</u>			<u>m</u>			<u>m</u>
<u>Mean</u>	<u>2.1</u>	<u>5.6</u>	<u>-0.5</u>	<u>2.5</u>	<u>3.0</u>	<u>1.8</u>
<u>Min</u>	<u>-0.8</u>	<u>1.3</u>	<u>-2.8</u>	<u>-1.4</u>	<u>-1.4</u>	<u>-1.4</u>
<u>Max</u>	<u>6.4</u>	<u>13.6</u>	<u>1.5</u>	<u>7.8</u>	<u>8.4</u>	<u>7.4</u>
<u>Std Dev</u>	<u>1.7</u>	<u>3.2</u>	<u>1.4</u>	<u>1.9</u>	<u>2.4</u>	<u>2.2</u>
<u>T-Stat</u>	<u>4.55</u>	<u>6.05</u>	<u>-1.94</u>	<u>3.93</u>	<u>4.62</u>	<u>2.97</u>
<u>P-value</u>	<u>0.00</u>	<u>0.00</u>	<u>0.06</u>	<u>0.00</u>	<u>0.00</u>	<u>0.01</u>

1992

<u>Difference</u>	<u>Transect 5 (n=28)</u>			<u>Transect 6 (n=27)</u>		
	<u>Mean</u>	<u>Minimum</u>	<u>Maximum</u>	<u>Mean</u>	<u>Minimum</u>	<u>Maximum</u>
<u>e</u>			<u>m</u>			<u>m</u>
<u>Mean</u>	<u>-2.4</u>	<u>1.8</u>	<u>-5.6</u>	<u>-1.6</u>	<u>-1.2</u>	<u>-2.0</u>
<u>Min</u>	<u>-6.9</u>	<u>-2.4</u>	<u>-11.7</u>	<u>-4.8</u>	<u>-4.5</u>	<u>-7.4</u>
<u>Max</u>	<u>4.0</u>	<u>10.5</u>	<u>1.0</u>	<u>4.2</u>	<u>4.4</u>	<u>4.2</u>
<u>Std Dev</u>	<u>-2.2</u>	<u>2.9</u>	<u>3.5</u>	<u>-1.5</u>	<u>2.3</u>	<u>2.5</u>
<u>T-Stat</u>	<u>-4.80</u>	<u>3.21</u>	<u>-8.50</u>	<u>-3.58</u>	<u>-2.62</u>	<u>-4.21</u>
<u>P-value</u>	<u>0.00</u>	<u>0.00</u>	<u>0.00</u>	<u>0.00</u>	<u>0.01</u>	<u>0.00</u>

**Table 11. Differences (degrees F) between temperatures recorded at the Ice Harbor Dam scroll case and the daily mean, minimum, and maximum transect temperatures recorded immediately upstream (#14) and downstream (#15) of IHR. Differences are expressed as scroll case temperatures minus transect temperatures, therefore a positive number means the scroll case temperature is greater than that at the transects. Also noted are the t-statistics and p-values for a paired-t test between temperatures recorded at the scroll case and mean, minimum, and maximum transect temperatures. Data presented is for the time period from start of data collection (July 23 in 1991 and July 2 in 1992) through September 30.**

1991

<u>Difference</u>	<u>Transect 14 (n=19)</u>			<u>Transect 15 (n=19)</u>		
	<u>Mean</u>	<u>Minimum</u>	<u>Maximum</u>	<u>Mean</u>	<u>Minimum</u>	<u>Maximum</u>
<u>e</u>	<u>m</u>			<u>m</u>		
<u>Mean</u>	<u>0.3</u>	<u>1.8</u>	<u>-2.8</u>	<u>0.1</u>	<u>0.4</u>	<u>-0.4</u>
<u>Min</u>	<u>-1.7</u>	<u>-0.4</u>	<u>-9.0</u>	<u>-2.4</u>	<u>-1.8</u>	<u>-3.6</u>
<u>Max</u>	<u>4.6</u>	<u>7.6</u>	<u>2.4</u>	<u>3.1</u>	<u>3.5</u>	<u>2.7</u>
<u>Std Dev</u>	<u>1.5</u>	<u>1.7</u>	<u>3.2</u>	<u>1.3</u>	<u>1.3</u>	<u>1.6</u>
<u>T-Stat</u>	<u>0.76</u>	<u>4.40</u>	<u>-3.80</u>	<u>0.30</u>	<u>1.35</u>	<u>-1.20</u>
<u>P-value</u>	<u>0.45</u>	<u>0.00</u>	<u>0.00</u>	<u>0.77</u>	<u>0.19</u>	<u>0.24</u>

1992

<u>Difference</u>	<u>Transect 14 (n=24)</u>			<u>Transect 15 (n=24)</u>		
	<u>Mean</u>	<u>Minimum</u>	<u>Maximum</u>	<u>Mean</u>	<u>Minimum</u>	<u>Maximum</u>
<u>e</u>	<u>m</u>			<u>m</u>		
<u>Mean</u>	<u>-1.8</u>	<u>-0.1</u>	<u>-4.7</u>	<u>-2.1</u>	<u>-1.8</u>	<u>-2.7</u>
<u>Min</u>	<u>-4.4</u>	<u>-2.1</u>	<u>-10.4</u>	<u>-5.1</u>	<u>-4.9</u>	<u>-5.9</u>
<u>Max</u>	<u>0.62</u>	<u>2.6</u>	<u>0.4</u>	<u>0.4</u>	<u>0.7</u>	<u>0.4</u>
<u>Std Dev</u>	<u>1.5</u>	<u>1.1</u>	<u>3.0</u>	<u>1.5</u>	<u>1.4</u>	<u>1.7</u>
<u>T-Stat</u>	<u>-6.69</u>	<u>-1.08</u>	<u>-8.38</u>	<u>-7.70</u>	<u>-6.96</u>	<u>-8.43</u>
<u>P-value</u>	<u>0.00</u>	<u>0.29</u>	<u>0.00</u>	<u>0.00</u>	<u>0.00</u>	<u>0.00</u>

**Table 12. Mean annual August – October scroll case temperatures from four Snake River dams. Time averaged and fall chinook weighted temperatures are listed for Ice Harbor Dam, Lower Monumental Dam, Little Goose Dam, and Lower Granite Dam.**

Year	<u>ICE HARBOR</u>		<u>L. MONUMENTAL</u>		<u>L. GOOSE</u>		<u>L. GRANITE</u>	
	<u>Time</u> <u>Averaged</u>	<u>Fish</u> <u>Weighted</u>	<u>Time</u> <u>Averaged</u>	<u>Fish</u> <u>Weighted</u>	<u>Time</u> <u>Averaged</u>	<u>Fish</u> <u>Weighted</u>	<u>Time</u> <u>Averaged</u>	<u>Fish</u> <u>Weighted</u>
1963	68.2	68.6						
1964	63.4	63.9						
1965	64.4	63.2						
1966	66.4	67.6						
1967	68.1	66.8						
1968	63.2	64.7						
1969	64.4	65.2						
1970	65.3	66.2			63.0	63.4		
1971	66.0	67.1	65.4	66.1	64.4	65.2		
1972	65.3	64.8	65.0	65.8	64.7	64.9		
1973	64.6	65.8	64.5	65.6	64.0	65.0		
1974	65.2	66.5	65.2	65.5	65.1	64.7		
1975	68.4	68.8	64.9	65.8	64.7	66.4	63.7	64.9
1976	66.3	67.4	66.0	66.8	65.9	66.3	65.4	64.4
1977	65.9	66.5	65.0	65.6	64.5	65.0	64.3	63.1
1978	65.0	65.9	64.6	64.8	64.1	63.6	63.8	63.8
1979	68.8	69.7	68.5	69.0	68.4	68.9	65.9	67.0
1980	66.9	67.2	65.4	65.7	66.2	66.6	64.4	64.1
1981	66.9	68.6	66.5	67.3	66.6	66.2	65.0	64.1
1982	65.9	67.7	65.4	66.5			64.2	64.0
1983	66.2	67.0	66.4	66.3			64.4	62.6
1984	65.8	66.9	65.1	65.8			63.3	62.8
1985	64.6	64.0	63.6	62.1			62.0	62.1
1986	66.6	65.3	65.8	63.4			64.4	60.8
1987	67.4	68.1	66.5	66.3			65.3	64.0
1988	67.2	67.3	66.0	65.8			66.6	65.9
1989	66.2	66.7	65.5	65.8			63.3	62.9
1990	68.0	68.8	67.1	66.9			66.2	65.0
1991	67.4	67.1	66.9	66.7	66.3	65.4	64.6	62.3
1992	65.5	65.9	65.2	65.5	65.1	64.9	63.5	62.9
1993	65.2	65.8	65.5	66.4	66.9	68.4	63.7	64.6
1994	65.9	66.6	66.2	66.9	67.6	67.9	65.7	65.0
1995	64.4	64.7	64.3	64.5	63.3	63.8	61.7	62.9





**Table 13. Migratory timing of fall chinook salmon in the lower snake River, 1963 – 1995. Mean annual fish weighted timing, standard errors (s.e.), and number of fish for each year of record at Ice Harbor Dam, Lower Monumental Dam, Little Goose Dam, and Lower Granite Dam.**

Year	ICE HARBOR			L. MONUMENTAL			L. GOOSE			L. GRANITE		
	Mean	s.e.	N	mean	s.e.	N	mean	s.e.	n	mean	s.e.	N
1963	9/21	0.13	12838									
1964	9/17	0.14	10924									
1965	9/20	0.13	12005									
1966	9/18	0.12	15018									
1967	9/28	0.10	19022									
1968	9/19	0.10	23855									
1969	9/20	0.12	16796									
1970	9/18	0.14	10163				9/19	0.18	6041			
1971	9/19	0.12	11004	9/20	0.10	10203	9/20	0.13	6084			
1972	9/23	0.16	9436	9/19	0.22	5192	9/21	0.37	2316			
1973	9/19	0.14	8353	9/19	0.17	5437	9/20	0.22	3169			
1974	9/22	0.26	2814	9/25	0.26	3020	9/27	0.39	1283			
1975	9/18	0.28	2558	9/18	0.23	3053	9/19	0.35	1605	9/22	0.35	2174
1976	9/18	0.35	1474	9/22	0.27	2085	9/24	0.49	1068	9/29	0.50	1218
1977	9/20	0.31	1756	9/23	0.31	1947	9/23	0.36	1256	9/29	0.38	1797
1978	9/17	0.41	1593	9/20	0.57	1013	9/25	0.50	1271	9/23	0.51	1442
1979	9/17	0.34	2056	9/20	0.40	1284	9/22	0.45	1190	9/21	0.38	1394
1980	9/22	0.37	1719	9/21	0.65	913	9/22	0.67	698	9/26	0.65	753
1981	9/20	0.29	2102	9/23	0.33	1624	9/27	0.38	1385	9/27	0.32	1714
1982	9/20	0.22	3519	9/22	0.29	2378				9/25	0.32	2134
1983	9/21	0.27	2735	9/22	0.38	1524				9/27	0.38	1433
1984	9/19	0.27	2445	9/21	0.43	1226				9/24	0.42	1322
1985	9/25	0.15	8907	9/28	0.19	5827				9/24	0.34	2127
1986	9/27	0.16	5798	9/29	0.16	4873				10/1	0.24	2410
1987	9/24	0.14	8375	9/28	0.21	4556				9/29	0.43	1212
1988	9/22	0.22	5882	9/22	0.32	3031				9/28	0.61	848
1989	9/20	0.21	5990	9/21	0.32	2918				9/25	0.61	923
1990	9/23	0.22	5317	9/27	0.35	2380				9/30	0.72	535
1991	9/24	0.18	6026	9/24	0.24	3245	9/26	0.39	1122	9/30	0.42	992
1992	9/23	0.20	5530	9/22	0.29	2493	9/22	0.38	1324	9/24	0.52	894
1993	9/21	0.28	3137	9/20	0.31	2296	9/20	0.37	1425	9/20	0.45	1168
1994	9/26	0.27	3133	9/27	0.30	2548	9/29	0.45	1219	9/29	0.48	1000
1995	9/25	0.20	5202	9/28	0.22	4616	9/27	0.31	2297	9/26	0.39	1348
1996	9/16	0.23	4618	9/19	0.24	3766	9/20	0.31	2338	9/22	0.36	1687